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Italian versus Northern Range port competitiveness: a transportation cost analysis in Chinese trade

Dionisia Cazzaniga Francesetti[1*]

[1]*University of Pisa, Italy*

Abstract

The paper presents an analysis of the costs of shipping containers from four Chinese ports to representative central European destinations. It is demonstrated that the sum of costs by sea and costs over land, using both truck and rail transport, clearly favours the Italian ports, above all those of Genoa and Trieste for a geographic range that does not include all the Northern countries of the European Union and Russia but does cover a considerable portion of the southernmost cities of these countries such as Milan, Munich, Vienna, Budapest, Bern, Lyon, and Kiev.

Other Italian ports can compensate for the handicap of the greater distance from this range of production and consumption zones, if they are appropriately reorganized with lower costs in direct competition with the Northern European ports, particularly the port of Naples, where COSCO has set up operation. However, despite the evident advantages in terms of distance and costs, Italian ports are unable to compete with those of Northern Europe on account of inefficiency affecting both their internal structure and inland transport. The purpose of the paper is to define costs in each sector (shipping costs, port costs and inland distribution costs) and to compare the relative port positions.

Keywords: Ports; Inland costs; Intermodality; China; Northern range ports; Competitiveness.

1. Introduction

This paper presents an analysis of the costs of shipping containers from four Chinese ports to representative central European destinations. It demonstrates that the sum of costs – in terms of generalised costs *stricto sensu* (i.d. GC=M+V*T, see World Bank) - by sea and costs over land, using both truck and rail transport, clearly favors Italian ports, above all those of Genoa and Trieste for a geographic range that does not include all the Northern countries of the European Union and Russia but does cover a considerable portion of the southernmost cities of these countries such as Milan, Munich, Vienna, Budapest, Bern, Lyon, and Kiev.

* Corresponding author: Dionisia Cazzaniga Francesetti (dcf@di.unipi.it)

The markets that can be served by Mediterranean ports and which, given their growth rates, are of interest to all the terminal operators and the liner companies are (Table 1):

- Market 1: part of the market of industrialized EU countries;
- Market 2: the Balkans and the market of the Russian area, and
- Market 3: the southern Mediterranean sea market.

Table 1: Markets served by Mediterranean ports.

Year 2004	*People mill.*	*GNP bill $*	*Growth %*	*Export bill $*	*Import bill $*
Market 1	175.8	4432	0.9	328	377
Market 2	253.1	1377	4.7	149	161
Market 3	256.2	2133	5.5	317	325
Total	685.1	7942	2.8	794	864

Source: Our elaboration from CIA World Factbook 2000.

Other Italian ports can compensate for the handicap of the greater distance from this range of production and consumption zones, if they are appropriately reorganized with lower costs in direct competition with the Northern European ports: in particular, the port of Naples, where Cosco has been set up. However, despite the evident advantages in terms of distance and costs, Italian ports are unable to compete with those of Northern Europe on account of inefficiency affecting both their internal structure[1] and inland transport.

The factors of port competitiveness are largely discussed in the literature. On Italian ports see CNEL (2004). The purpose of this paper is to define costs in each sector (shipping costs, port costs and inland distribution costs) and to compare the relative port positions.

2. Deepsea Shipping Costs

In this analysis the following approach has been taken: for deepsea container shipping attention is focused on shipping costs, underlining a comparison among different shipping options as viewed from the perspective of the shipping lines.

Freight rates are not used here as a parameter for Asia-Europe trade (Yap et al., 2003) because of their well known volatility. It would be a mistake to adopt an approach that is quantified in terms of specific rates at a particular time as this could easily distort the underlying competitive positions of transport alternatives. The correct approach focuses on the underlying costs of representative trading.

Freight rates on the headhaul trades (i.e. those where the proportion of empties is negligible) are at present running at very high levels. In spite of this, a general decline in freight rates has been noted over the last ten years.

It is interesting investigate briefly the ups and downs of freight rates before developing our theme.

[1] The factors of port competitiveness are largely discussed in the literature. On Italian ports see CNEL (2004).

The reason why freight rates decreased over a prolonged period is linked to the process of consolidation in which the great liner shipping companies are still engaged. For the last few years, a growth in containerized trade of at least 5%-6% a year for the next fifteen to twenty years has been forecast by the major analysts of the sector (Lloyd's, Ocean Shipping Consultants, Drewry Shipping Consultants, etc.). This means a three-fold increase in container throughput by sea within 2025. Consequently, the great liner shipping companies have long been accelerating not only the consolidation process, but also their orders for new and ever bigger ships (Cazzaniga Francesetti D., 2005) and until recently, they have been enacting a policy of reduction in freight rates in order to eliminate competitors and smaller Companies (a predatory strategy) so as to obtain maximum market power. Thus up to 2002 the most important motives underlying the decrease in freight rates were partly the stiff competition among companies to gain hold of the greatest possible market and (paradoxically) also the excess supply by the liner shipping companies. This excess resulted from the race to achieve economies of scale by means of gigantic ships designed to absorb the greatest possible demand for transport.

But since the end of 2002 the Chinese boom has accelerated the increase in container throughput and led to an escalation in freight rates for containers and also for liquid and dry bulk cargoes. Dry bulk freight rates literally took off to unprecedented heights, fuelled by China's enormous needs for raw materials and other primary products used to develop its infrastructures. This take-off even accelerated during the period from the second half of 2003 up to the present time. Tanker rates experienced impressive ups and down during the year but resulted in an average level well above the previous years. Container freights rates marked a strong progression. Barry Rogliano Salles (2004) highlights the sharp rise in container freight rates from the end of 2002 onwards, after the ups and downs but *predominantly* decreasing trend that had been a characteristic since the 1990s. Furthermore, the robust levels of freight rates in 2003-2004 certainly helped a new wave of orders of new ships without taking into account the excess supply estimated until the end of 2002. (see Hoffman, 1998; Notteboom, 2004; Baird, 2001; Cullinane and Khanna, 1999; Haralambides, Cheung Tam He and Tsolakis, 2000)

Let us now consider three classes of vessels: the 4000TEU and the 6500TEU which are currently dominant on the trade, and the 12,500TEU capacity vessels which will enter into working activity as from 2010, with just a few units, and a saving at-sea of some 29 per cent between 6500TEU and 12500TEU vessels under the current cost regime. The data considered for these vessels include: Capital costs, Operating costs, Bunker charges. These costs will obviously change in the future as a result, primarily, of the introduction of larger classes of vessels into the trades. It is apparent that scale economies are the driving force behind the push to larger sizes of vessels (Table 2).

In order to reflect current distribution on the Chinese trades four origin ports have been selected: Dalian – in the north; Shanghai – in the east central region; and Hong Kong and Yantian – representing the Shenzhen markets. On the basis of the distance in nautical miles the distances of these ports from same Italian and northern range ports are calculated. The European ports selected are: Antwerp, Rotterdam and Hamburg in the north and Gioia Tauro, Taranto and, in regard to some aspects, Naples in the south.

Table 2: Container ship-trading costs 2004.

	4000TEU	*6500TEU*	*12500TEU*
Capacity - TEUs	4000	6500*	12500**
Capital Costs			
Newbuild Price - mUS$	58.0	89.5	123.0
Daily Capital Charge - $	23912	36898	50709
Operating Costs			
Manning - US$/day	4400	4750	4750
Repair & Maintenance - US$/day	3673	5668	7790
Insurance - US$/day	2513	3878	5330
Admin/Other Charges - US$/day	1500	1750	2000
Total	12086	16046	19870
Fuel Costs			
HFO - US$/tonne	220	220	220
MDO - US$/tonne	350	350	350
Consumption At Sea - 25knots			
HFO – tonnes/day	140.0	256.0	350.0
MDO - tonnes/day	2.5	2.8	3.0
Consumption In Port			
HFO - tonnes/day	0.0	0.0	0.0
MDO - tonnes/day	2.5	2.8	3.0
Fuel Costs At Sea - US$/day	31675	57300	78050
Fuel Costs In Port - US$/day	875	980	1050
Total Costs At Sea - $/day	67673	110244	148629
Total Costs In port - $/day	36873	53924	71629
Per TEU At Sea - $/day	16.92	16.96	11.89
Per TEU In Port - $/day	9.22	8.30	5.73
Per Container At Sea - $/day	25.38	25.44	17.84
Per Container In Port - $/day	13.83	12.44	8.60
Per Container At Sea - €/day	19.37	19.42	13.61
Per Container In Port - €/day	10.56	9.50	6.56

* excludes agency, marketing and liner servicing costs.
** potential vessel.
These costs attempt to quantify the full costs of ownership and are not based upon charter rates. As owned vessels remain the dominant approach for most major lines this is appropriate.
Source: Ocean Shipping Consultants Ltd.

Northern range ports are organized in a ‘so-called’ multiport system each one playing the role of hub. On the contrary Naples can play a role both of feeder and regional

gateway port. Nevertheless the port of Naples, like Genoa and Trieste, is not a hub port, in the light of its technical characteristics, but it is the only Italian port where a major Chinese company, COSCO, manages a terminal in a joint venture with other companies. Recall that a hub port is a central port of a vast geographic area, where cargo departs towards or arrives from a huge range of commercial ports. The hub port is located on the shortest route that leads directly across the area, and by virtue of its deep draught (16m.), it enables gigantic over-6000 TEU ships to dock[2]; its port operations are very efficient, and travel times and schedules are carefully respected. Mother-ship gains an advantage above all from: maximum reduction in transit time and an optimal load factor (roughly 95%) guaranteed by the great industrial centers of the hinterland.. In Northern Europe, unlike the Mediterranean, the close proximity of great ports with large markets in the direct hinterland means that there is still a notable presence of direct calls on an average transshipment share – the transshipment is less than 40% out of total container throughput (Notteboom, 2004).

The approach taken is to *define costs at-sea and in-port and apply these to representative voyages on the basis of known voyage times and port rotations*[3] This has been calculated on the basis of a high load factor of 95 per cent which reflects the current position for China-Europe trades. Other relevant costs such as Suez Canal charges have also been included in the analysis. These voyage costs are then converted to shipping costs in terms of Euros per 40' container (FEU).

There is a fairly significant shipping cost saving for the Italian hub port option, and let us consider Naples a part. This reflects the shorter haul lengths involved.

Table 3**:** Summary table – Deepsea shipping costs 2004*- Euros per 40' container**.

To	*Rotterdam*	*Antwerp*	*Hamburg*	*Gioia/Taranto*	*Naples*
From 4000TEU vessel					
Dalian	774.21	774.59	788.07	651.62	652.98
Shanghai	753.55	753.82	767.30	630.86	632.22
Hong Kong	711.31	711.58	725.06	588.62	589.98
Yantian	712.67	712.94	726.42	589.98	591.34
6500TEU vessel					
Dalian	743.07	743.34	756.85	620.07	621.43
Shanghai	722.25	722.52	736.04	599.25	600.61
Hong Kong	679.90	680.18	693.69	556.90	558.27
Yantian	681.27	681.54	695.05	558.27	559.63

*excludes agency, marketing and liner servicing costs.
** calculated at US$1.3 - 1€.
Source: our elaboration on Ocean Shipping Consultants (OSC) data.

It currently costs around €743 to ship a container from Dalian to Rotterdam or Antwerp in a 6500TEU vessel. The comparative costs to Gioia Tauro, Taranto are

[2] 'Strategies for container port'- supplement of the magazine 'Cargo system' march 2001

[3] It has been considered: days and costs for two vessels TEU6500 and TEU4000, load factor 95%, ocean haul length, sea days at 22 knots, port and canal days, cargo size- boxes (4117 for a 6500 TEU vessel, and 2533 for 4000TEU vessel), sea costs per day, port costs per day, total sea costs, total port costs, canal charges, voyage cost, n. FEU, cost per FEU, euro per FEU.

placed at some € 620 per FEU. It is this cost saving that must be set against higher inland distribution costs. It should be noted that these costs are only vessel costs and are those that are incurred for the operation of a vessel by an owner/operator. As the primary function of this analysis is to derive comparative costs other liner charges have not been included in the analysis.

3. The costs of port transit

As regards port costs in the ports under review, port transit costs are examined, consisting of both port dues and stevedoring costs. Port dues[4] - charges that are levied by Port Authorities and other agencies for utilisation of dock facilities and for access to the berths represent a major cost sector that is important in determining the competitive position of a particular port or terminal. Port dues are defined under several large categories that are relevant to each port.

Stevedoring charges –payments from the shipping line to the terminal operating company for offloading, storing and loading the container onto a barge, truck or rail wagon.

3.1 Port transit costs: port dues

This represents a highly complex area. The charging structure is different in each port and there are also great differences between the various locations served within each port. Some of these charges may be regarded as statutory, and are thus not open to negotiation, whilst in other instances the interests of the Port Authorities are seen to influence the actual charges that are levied.

Typical rates have been identified for the following container operations.

Deepsea Operations – 1. This assumes the regular berthing of a 4000TEU fully-cellular containership, with a GRT of 55,500t, LOA 295m and a draught of 12m. This will regularly call at the identified port, but will only appear a maximum of five times per annum. At each call, 1530 containers are handled.

Deepsea Operations – 2. This assumes the regular handling of a 6500TEU (S-Class type) fully-cellular container ship, with a GRT of 91,650t, LOA 347m and a maximum draught of 14.5m. Once again, a regular discount is relevant, and consignment size is placed at 2290 containers.

These conditions are to be seen as fairly representative of the current and anticipated market under consideration – although consignment sizes are now increasing.

Under standard liner terms, the ship owner (or operator) carries the entire responsibility for ship-specific costs. Operators may of course undertake considerably greater responsibilities, if they operate their own terminal and/or distribution system. Total ship-related costs can be significant, although they tend to be the aggregate of numerous individual components. These costs vary greatly on a port-specific basis. Such differences force a piecemeal and empirical approach to be adopted in determining

[4] Typical rates have been identified for the following container operations.

costs. However, in the ports under review, it is clear that costs are defined under several major categories that are relevant to each port.

These include:

- *Harbour Dues*. These are usually calculated on the basis of vessel GRT, but are sometimes cargo-specific.
- *Berthing Dues* are calculated on the basis of cargo volume and charged to the ship owner. This system predates containerization, but remains of significance in Belgian ports.
- *Towage* in docks and on approaches is related to distance traveled, vessel LOA, number of movements and number of tugs involved.
- *Pilotage* is charged both within the harbour and on approach, and is usually determined by the draught and/or LOA of the vessel.
- *Mooring and Unmooring* is usually billed as an additional charge and is also usually determined by vessel LOA.

The data considers the current cost structures in the various ports under review. These have been calculated on the basis of published tariffs, adjusted by direct feedback from ship owners with regard to the actual charges paid[5]. The basis for the calculation of these charges is complex and is clouded by the availability of discounts and special arrangements for favoured customers. However, it is clear that North European ports are more expensive than the Italian ports under current market conditions (but the conditions of in-port efficiency and the true availability of intermodal means in Italian ports are dubious).

Table 4: Comparative port dues calculated for 2004 (Euros per container).

	Euros/call	*2004-1 Euro/container*	*Euros/call*	*2004-2 Euro/container*
ECT Delta	26998	17.65	36002	15.72
Antwerp Sckeldt	33979	22.21	49581	21.65
Hamburg Altenwerder	43735	28.58	59715	26.08
Naples	26775	17.50	34007	14.85
Gioia Tauro /Taranto	22751	14.87	28053	12.25

1-4000TEU deepsea liner (55500 grt, 295m loa,12m draught) handling a total of 1530containers per call. Line calls 5 times per month.
2-6500TEU deepsea liner (91650grt, 347m loa, 14.5 draught) handling a total of 2290 containers per call. Line calls 5 times per month.
NOTE. These data are, of course, highly dependent on consignment size, as noted. The costs are increased and spread across the number of the containers typically loaded.
Source: Our elaboration on data OSC Ltd.

3.2 Port transit costs: Stevedoring Charges

Attention will now turn towards the current level of container handling charges in the major terminals under review. The intention of this analysis is to allow a direct comparison of the actual prices paid by the shipping lines to the terminal operators in

[5] It is known that further discounting is available for major customers in most ports, with Port Authorities anxious to improve the competitive position of their terminals. However, data on this is sketchy and difficult to compare directly. In some cases, however, discounts of 20-25 per cent have been noted.

each of the ports under review. The resulting 'container handling charge' is different from the publicly quoted 'terminal handling charge' that is levied by shipping lines on the cargo owners. The methodology utilized here reflects the complexity of the issues involved and, accordingly, provides typical cost estimates on the basis of: published tariffs, data provided by container terminals and data provided and confirmed by major shipping lines.

In general, the level of the container handling charge is seen to be highly commercially sensitive and there are several areas where the market is opaque to analysis. However, on the basis of continuing reviews of these issues for numerous specific studies in the past fifteen years[6] it is possible to provide a degree of direct comparison and to analyse the true relative position of the terminals under analysis.

The identification of container handling charges is an extremely complex undertaking. Whilst some terminals publish a tariff for container handling costs, this provides only the most general guide to the level of charges that are actually levied. It is usually the case that discounts are available for volume customers and often further flexibility is made available in the light of major marketing initiatives. In addition, the various activities included in 'container handling charges' are also found to vary between ports and, indeed, often in different terminals within the same port.

There are two major points to be addressed in ensuring that the data are comparable: what is the consignment size (i.e. what type of customer is being served)? And what is actually included in the tariff?

3.2.1 What is the consignment size?

Container handling charges in most ports are seen to be highly sensitive to marketing initiatives. In order to minimise the resulting divergence in quoted rates an assessment has been made of a 'typical customer' i.e. a representative deepsea liner customer, and the key details are as follows: the contract covers an annual handling of around 76,500/114,500 units; the service offers around 50 calls per annum; typically 1530/2290 containers are handled per port call; the average vessel sizes are 4500-8800TEU; TEU/FEU box ratio: 50/50; loaded/Empty ratio: 80/20.

This represents a fairly medium to small customer for higher volume ports and it may well be the case that further bulk discounts could be negotiated as volumes increase further. It is estimated that with volumes increasing to above 0.25m units per annum a price reduction of around 4.5-5 per cent could be achieved. This can be anticipated when Ultra Large Container Ships are introduced into the trades.

3.2.2 What is included in the tariff?

The Basic Handling Charge includes: -Handling costs between ship and yard (in either direction); -Handling costs between yard and gate (in either direction).

Other handling charges that are also billed to the customer in different degrees in each terminal include: hatch opening and closing; cargo plan preparation; overtime costs; lashing/unlashing; extra yard moves; weighing; and stand-by on vessel account.

[6] Various OSC reports.

In the analysis, handling charges relate to the cycle of container movements between the vessel and the gate of the yard (on rail, road or barge) in each direction. In most cases these are directly comparable but in some instances – specifically in Antwerp – the position is more complex, with some charges billed to the shipping line and some to the shipper (cargo owner/forwarder).

Basically, the representative costs for container handling consist in a payment of 113.45 euro at ECT of Rotterdam, 93 euro at Antwerp, 115.16 euro at Hamburg, 131.00 at Naples, 102.45 euro at Gioia Tauro/Taranto.

The following points should be noted: there is strong competition in stevedoring prices between Antwerp and Rotterdam terminals. Generally speaking, Antwerp has always been cheaper and this reflects its less favorable riverine location. Handling prices are somewhat more expensive in Germany, with this reflecting the strong level of demand and the somewhat distinct hinterland. Italian ports have historically been more expensive and this is still noted at Naples. Prices are much cheaper at present in Gioia Tauro, with this reflecting the owner's strong commitment to developing the import/export sector.

Table 5**:** Container handling charge for regional ports 2004.

	*Port container**
ECT Delta	113.45
Antwerp-Sckeldt	92.46
Hamburg- Altenwerder	115.16
Naples	131.00
Gioia Tauro and Taranto	102.45

*vessel-gate.
Analysis has been developed on each of the ports under review since the early/mid 1990s.
Source: OSC Ltd.

3.3 Total port transit costs: miles, days, euros from China

In conclusion, let us present the differences in terms of miles, days and euros per FEU (M+V*T) from China to the cheapest and closest Northern European port (Antwerp) and towards the most expensive and most distant port (Hamburg) and towards the Italian hub ports of Gioia Tauro and Taranto with the feeders Genoa and Trieste.

Table 6 also shows, for Italy, the costs per FEU and the additional distances to reach the feeder ports of Genoa and Trieste from the hub ports of Gioia Tauro and Taranto.

It can be noted that while the Italian ports present some advantages as regards total journey days and costs (above all in terms of travel time), the *journey differences* compared to Northern European ports are always positive, but are almost two days longer if the legs for the two feeder ports of Genoa and Trieste are added. *This observation makes it clear that the maritime leg is not the only focus of competition* in seeking to attract Chinese merchandise (and goods originating from the Far East in general). Rather, competition comes into play on the expensive inland terrestrial leg, as will be illustrated below in further detail.

It must be taken into account that the Northern European ports, with their vast inland import-export activity, are final/initial ports for goods, that is to say, they are not feeder ports that depend on a hub, like the Italian ports. They *do not* form part of a hub and

spokes system because vast reference markets lie directly behind them. In Italy, on the other hand, the distances of the feeder ports of Genoa and Trieste[7] from the hub ports of Gioia Tauro and Taranto[8] must also be considered.

Table 6: Miles, days, euros per FEU of four Chinese ports to representative destinations.

From Yantian to	*Miles*	*Days*	*Euro/FEU*
Antwerp	9769	19,4	624
Hamburg	10014	19,9	636
Gioia Tauro	7485	14,9	513
Taranto	7485	14,9	513
Genoa	7959	15,8	656
Trieste	7995	15,9	658

From Shanghai to	*Miles*	*Days*	*Euro/FEU*
Antwerp	10521	20,9	661
Hamburg	10766	21,4	673
Gioia Tauro	8237	16,3	550
Taranto	8237	16,3	550
Genoa	8711	17,3	693
Trieste	8747	17,4	695

From Hong Kong to	*Miles*	*Days*	*Euro/FEU*
Antwerp	9744	19,3	623
Hamburg	9989	19,8	635
Gioia Tauro	7460	14,8	512
Taranto	7460	14,8	512
Genoa	7934	15,7	655
Trieste	7970	15,8	65

From Dalian to	*Miles*	*Days*	*Euro/FEU*
Antwerp	10903	21,6	679
Hamburg	11148	22,1	691
Gioia Tauro	8619	17,1	568
Taranto	8619	17,1	568
Genoa	9093	18,0	711
Trieste	9129	18,1	713

Source: our elaboration partially relies on OSC data.

4. Inland Distribution Charges

The remaining cost sector that is critical to the competitive position of the port is the inland distribution cost from the terminal gate to the consignee. In order to define the

[7] For Genoa and Trieste, data on the costs of the maritime leg, transit and handling costs etc. were likewise obtained directly from the Authorities and checked by means of the liner shipping companies.
[8] Gioia Tauro and Taranto are, according to the rules of the hub and spokes system, ports on the shortest route between Suez and Gibraltar, but, commercially speaking, their hinterland is the desert.

competitive position with regard to inland distribution costs, it is necessary to analyse current (and forecast) comparative cost developments between the identified ports and the inland locations.

The following representative locations have been used in the current analysis: Milan; Munich; Vienna; Budapest; Bern, Lyon, Kiev.

Inland distribution for these trades is dominated by the rail option. The haul lengths involved are clearly sufficient in most cases to justify the use of intermodal trains and this is the main option. There may also be significant truck movements but the costs involved limit the use of this option to smaller consignments and to specific locations that are not well accessed by intermodal terminals. Note that, in spite of the reliability of sources, contracts with truck or train carriers can vary according to the number and frequency of containers. The costs of train and truck change in each country (although Italian rail does seem to be somewhat cheaper). This analysis does not consider the relative efficiency of different rail operators and it should be noted that shippers report strong difficulties with the Italian routeing at present, explaining why shippers continue to pay a reliability premium for the northern option. The Italian difficulties are primarily linked to concerns over capacity.

Several regional studies highlight the different prices per km. for rail and truck in each country, but it is difficult to standardize the different criteria used. In our inquire the indicative rates are based upon those quoted by large haulier and rail operators for contract volume business reported by OSC; rail and road charges on the routes under review are based upon quoted rates in the second half of 2004. Furthermore, it must kept in mind that the terminal operators and those liner companies that have network terminals can reduce the tariffs by choosing one or another port, especially if they have control over the inland transport. This could make a port particularly attractive.

4.1 Inland costs.

Truck: cost/km.

In Europe, according to our OSC data elaboration, truck transportation cost ranges from €1.99 for 200 km stretches, to €1.26 for 600 km, to €1.00 up to 1800 km stretches. In Italy the real cost (not the official one, according to Cetena[9]) that transportation workers apply is calculated at around €1.19/km (official fares), and €0.42/km (real fares) for long distance stretches. It should be remembered that in Italy the majority of hauliers are composed of small companies or even one-man trucking businesses that either work independently or take on outsourced work for the large trucking companies. Such hauliers, who cover the greater part of the Italian market, not only do not observe the rules but they face very stiff competition in procuring loads. This explains the difference between the figures provided by the official Associations of the category of hauliers and the actual situation.

[9] According to Cetena (2003), the official cost by truck is roughly 1, 19 euro; the real figure of 0.42, which is a lower cost, is due – as mentioned above – to failure to respect the rules on hours of rest, motorway speed and other aspects.
See also http://www.iicgenova.it/documents/ricerca/workshop_160505/Mor.pdf.

Train: cost/km

Train transportation costs, according to our OSC data elaboration, adds the cargo breaking costs (around €150/FEU—Source: OSC). The cost varies from €1.10 for 600 km, to €0.75 for 1200 km stretches, to 0.66 over 1800 km.

As regards speed, although the White Book of European Commission (2001) calculates just 18km/hour for European trains (because of heterogeneous organization, repeated controls in every country, different kinds of goods transported —such as livestock—etc.), this value was not taken into consideration, because block trains with 20-30 cars leaving from ports have higher average speeds. The average ground speed has been calculated to be around 30-40 Km/h.

It is well known that throughout Europe, although train transportation has constantly augmented, it has not able to keep up with port growth. Together with the high costs induced by the various rigidities, and the cargo breaking costs with train transportation, this constitutes the reason for the popularity of container transportation via truck.

For trucking, pricing is normally made on a distance basis, with heavy loading of short moves, which would limit driver utilisation over his working shift, and within some sort of contract arrangement. Deep-sea carriers generally have weekly services, and usually have to use larger hauliers who, in effect, gain further economies through consolidating haulage.

The effect of distance on rate per kilometre is illustrated in Figure 1. This is based upon a continuous review of actual rates charged in the European market and includes the recent tightening of the market. This has been driven by both increasing demand and also by a progressive increase in trucking cost structures.

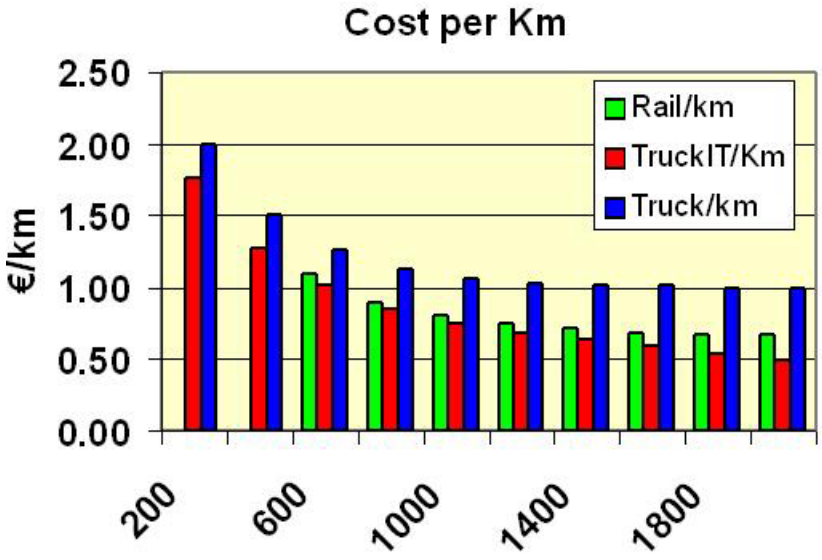

Fig. 1: Cost per km.
Note: Train cost in the table is augmented by the breaking costs.
Source: based on OCS and Cetena data.

4.2 Total inland costs

Let us now present the total inland costs by road or rail multiplied by the distances

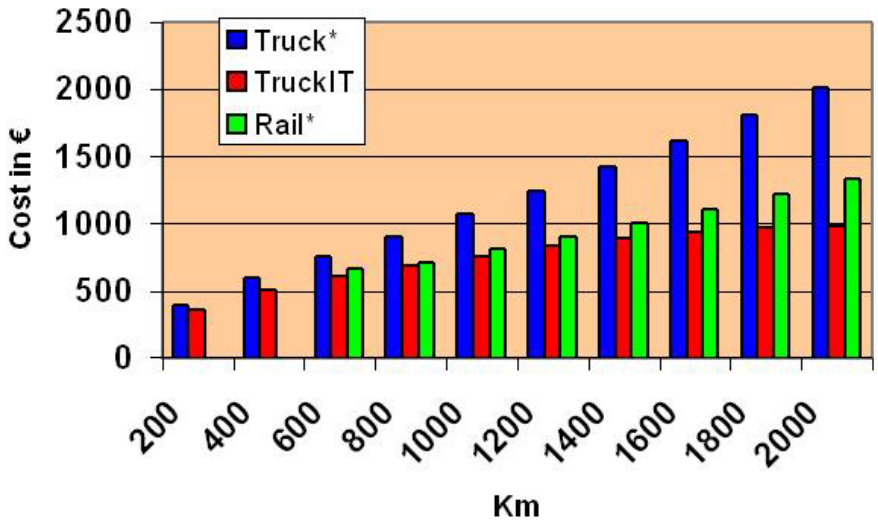

Fig. 2: Total inland costs.
Average base costs - Source: based on OCS and Cetena data.

Advantages in terms of distance: truck or train in relation to the different stretches.

Let us apply the costs identified (Figure 2) for the inland distances that separate some maufacturing and consumption cities of markets one and two from the ports under examination. It should be kept in mind that it is these costs, rather than the cost of the maritime leg or even the number of days at sea towards the European ports, that determine port power of attraction.

On a case by case basis, the shortest distance in kilometers either by train or by truck was used. Table 7 shows a number of surprising facts:

- the distances between Trieste and Munich, Vienna and Budapest are less than half of the distances between Trieste and the three northern ports.
- the distances between Genoa and Munich and Bern are less that 2/3 of the distances between Genoa and the northern European ports.

In short, through Italy one would achieve a 51% reduction of costs, 51% for Budapest, 34% for Bern, 48% for Vienna, and 39% for Lyon. Basically, in terms of distances, Genoa and Trieste are clearly the best options to serve markets one and two.

Table 7**:** Distances in Km.

Distances	*Rotterdam*	*Antwerp*	*Hamburg*	*Minimum northern ports*	*Genoa*	*Trieste*	*Minimum Italian ports*
Milan	1045	945	1230	945	138	412	138
Munich	875	790	785	785	645	515	515
Vienna	1200	1100	935	935	1025	490	490
Budapest	1455	1355	1195	1195	1265	585	585
Bern	795	690	925	690	455	737	455
Lyon	873	768	1142	768	469	842	469
Kiev	2610	2510	2350	2350	2420	1740	1740

Shortest distance	*Milan*	*Munich*	*Vienna*	*Budapest*	*Bern*	*Lyon*	*Kiev*
Northern ports	945	785	935	1195	690	768	2350
Italian ports	138	515	490	585	455	469	1748
Reduction %	85%	34%	48%	51%	34%	39%	26%

Source: our elaboration partially relies on OSC data.

Advantages in terms of costs

Let us will now examine the typical inland costs per FEU. The costs of inland stretches per FEU was calculated because the majority of containers considered are 40 feet long, that is, about 12 m.. Let us note that by using vehicles which travel from the closest Italian port to reach the above mentioned cities instead of trucks or trains[10] coming from the Northern European ports a cut in costs ranging between 21 and 70% is achieved.

Table 8: Indicative inland costs per FEU.

TRUCK	*Northern ports*	*Italian ports*	*Cuts%*	*RAIL*	*Minimum northern ports*	*Minimum Italian ports*	*Cuts%*
Milan	1022	310	70%	Milan	802	326	59%
Munich	894	691	23%	Munich	726	594	18%
Vienna	1013	672	34%	Vienna	797	581	27%
Budapest	1237	743	40%	Budapest	924	630	32%
Bern	821	645	21%	Bern	681	562	18%
Lyon	880	656	26%	Lyon	718	570	21%
Kiev	2352	1750	26%	Kiev	1566	1215	22%

Source our elaboration.

4.3 Total advantages. Sea-land legs

Finally, let us look at the global intermodal ship+truck or train costs. In Table 9 the costs by sea are summed (hypothesizing a 6000Teu full container from Asia) with costs by land per FEU, contrasting Italian with Northern European ports and showing the absolute and percent advantages. The interest per single container out of the average value of a container (roughly 30,000/35,000 dollars. Source: our investigation) for the additional days required to reach the Northern ports is also indicated. For the sake of

[10] Despite the fact that the train is the best option for ecological reasons as well. See White book.

brevity, let us present only the data concerning the port of Shanghai, which is located in the centre of China.

Table 9: Global costs*.

From Shanghai to	*Northern ports*	*Italian ports*	*Time cut, days*	*Price cut*	*% reduction*	*Capital interest*
	Euro/FEU	Euro/FEU		Euro/FEU	%	Euro/FEU
Milan	1576	960	4.6	616	39%	35
Munich	1512	1213	4.4	299	20%	34
Vienna	1583	1200	4.6	382	24%	36
Budapest	1710	1248	4.8	462	27%	37
Bern	1455	1160	3.9	295	20%	30
Lyon	1492	1167	3.9	325	22%	30
Kiev	2352	1881	4.8	472	20%	37

*As per OSC data, it was calculated a €113 THC for northern European ports, € 117 for Genoa, and € 138 for Trieste.
Source: our elaboration.

5. Conclusions

Attention as been directed towards the overall transport costs involved in serving the markets identified on various Chinese trades. This is an aggregation of the cost sectors already discussed, with shipping costs, port and stevedoring charges and inland delivery costs being the areas under review.

The following conclusions can be drawn from these data:

- The inland rail/truck charges and shipping costs are of basic importance and developments in each sector will have a proportional impact on comparative costs.
- The costs of port transit (dues plus stevedoring) are a relatively small part of the chain and discounting in this sector will have a marginal impact on route choice.
- On a cost basis Italian ports are competitive for several markets of central-southern Europe including the Balkans and Kiev. This represents a changed situation. As recently as 2000 the costs were lower for the Northern Europe option. This reflects the improved productivity of the ports and rail system. However, Italian standards of reliability remain lower and shippers continue to pay a reliability premium for the northern option.
- There has been a progressive shift northwards of the economic watershed in the past few years and it is apparent that Italian ports can now also be competitive particularly in the central-southern region, although market share remains limited.
- In the central European market – here represented by Vienna and Budapest till Kiev – each option is broadly competitive on a cost basis. *This will be the area of greatest competition* in the coming period.
- As the data show, it is above all the inland legs that constitute the crucial focus of competition between Northern European ports and Italian ports. This observation is indirectly confirmed by the double strategy of terminal operators and the liner shipping companies. Both set themselves as their prime objective

the aim of obtaining the concession of the greatest number of terminals, creating a network in Northern Europe and Italy (as in the Mediterranean) of interchangeable ports. As their second objective, they aim either to acquire directly or to manage port-related intermodal truck/train services by joint-venture in order to manage the entire transport chain.

Finally some issues are not captured by this purely cost/distance based approach. Firstly, there is a clear time advantage for the Italian option on Asian trades. This can be a significant issue for higher value cargoes – providing schedules are maintained.

Secondly, inland costs are based upon quotations from providers. It should be noted that delays are more frequent on the Italian option and that intermodal links from northern ports are now highly efficient. It is not possible to directly cost these issues but they are often noted as negatives for the Italian option. These problems can be solved. Furthermore, the greater the increase in container movement in the northern ports, the greater the likelihood that they may achieve economies of scale over the entire journey.

Generally, it is clear that the process of modification of the Italian port and intermodal sector has progressed very rapidly and re-secured much of its natural hinterland. The next stage will be to increase its competitive position in the identified markets, particularly EU markets. The EU market's low growth rate should not deceive: the importance of EU markets is based on the fact that, compared with the other two markets, it buys a bigger range of goods with high added value, and, above all, on the fact that it is able to sell goods with high added value to China.

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